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Title:	Chicago Pile-1 paved the way for nuclear science and a lab in Los Alamos First self-sustaining nuclear chain reaction was nearly 80 years ago
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Chicago Pile-1 paved the way for nuclear science and a lab in Los Alamos
First self-sustaining nuclear chain reaction was nearly 80 years ago
By National Security Research Center staff

On a bitter-cold winter day, 43 scientists gathered at an abandoned squash court at the University of Chicago where they would ultimately enable a secret lab in Los Alamos to change the world just years later.

It was December 2, 1942. The group, led by Italian physicist and Nobel laureate Enrico Fermi, stacked graphite bricks, piling 57 layers that totaled more than 770,000 pounds.

Later named Chicago Pile-1, their goal was to create the world's first self-sustaining, controlled nuclear chain reaction.

Inside the approximately 20-feet-tall pile were smaller blocks of uranium and control rods that, when removed, would cause the reaction to go critical – meaning create a nuclear chain reaction. It was roughly $1 million worth of materials, equivalent to nearly $16 million today, and a concept that a nuclear chain reaction would allow the weaponization of the atom.

"Its success would be the crucial proof needed to know it would be possible to create an atomic bomb," said LANL Historian **Roger Meade** (C-NR). "This was the precursor to the Lab we have today, nearly 80 years later."

But No Eeyore
Fermi watched alongside his team – all men and just one woman, 23-year-old physicist Leona Marshall – from a balcony. They were monitoring the experiment on instruments named after fictional children's storybook characters: Pooh, Piglet, and Tigger, according to the Department of Energy.

Shortly after 3:30 p.m., rods were removed one at a time. One was controlled from a balcony, one was an emergency safety rod and another would be withdrawn by scientist George Weil to cause criticality.

"Although Fermi was confident that he could control his experiment," Meade said, "he nonetheless stationed three graduate students, known as the suicide squad, on top of the reactor to pour buckets of a cadmium solution over the experiment if the safety mechanism failed. The cadmium (a chemical element) solution would soak up neutrons and quash the fission process."

Luckily for the graduate students, their role was in vain. As the final rod came out, Fermi reportedly said, "This is going to do it. Now it will become self-sustaining."

He was right.

On to Los Alamos

A coded message, “The Italian navigator has just landed in the new world,” notified government officials of the experiment’s success and the team celebrated with paper cups of Chianti (Italian red wine).

Many of the scientists signed the label on the wine bottle, which ended up being the only written record of attendees, according to the Department of Energy.

Many of the scientists from the Chicago Pile-1 team, including Fermi, would go on to work for the Manhattan Project’s secret wartime lab in Los Alamos. There, the results of the experiment were used to develop the world’s first nuclear explosive device during the Trinity test in July 1945. Two atomic bombs were released weeks later in combat against Japan; WWII ended shortly thereafter.

Want a commemorative poster?
Materials, such as photos and early scientific data, related to early experiments are part of the collections in the National Security Research Center (NSRC), which is the Lab’s classified library. The NSRC also houses unclassified legacy materials, including a print of a lithograph depicting Chicago Pile-1.

In commemoration of the Chicago Pile-1 anniversary, NSRC art director and graphic designer **Paul Ziomek** (Communication Arts and Services, CEA-CAS) created a poster that can be printed and displayed. Just click and print. The posters are approved for display.

<<poster image>>

Want to see a piece of history?
The Lab’s Bradbury Science Museum has on display a bar of graphite that was stacked near the center of the core of the Chicago-Pile 1 reactor. Argonne National Laboratory in Illinois sent the bar to Los Alamos in 1992 from its inventory of the Chicago Pile-1 graphite bars.

After the bar’s arrival in Los Alamos, Albert Wattenberg from the University of Illinois at Urbana-Champaign verified its authenticity, alongside Roger Meade, who was the Lab’s archivist at the time and is now a Lab historian.

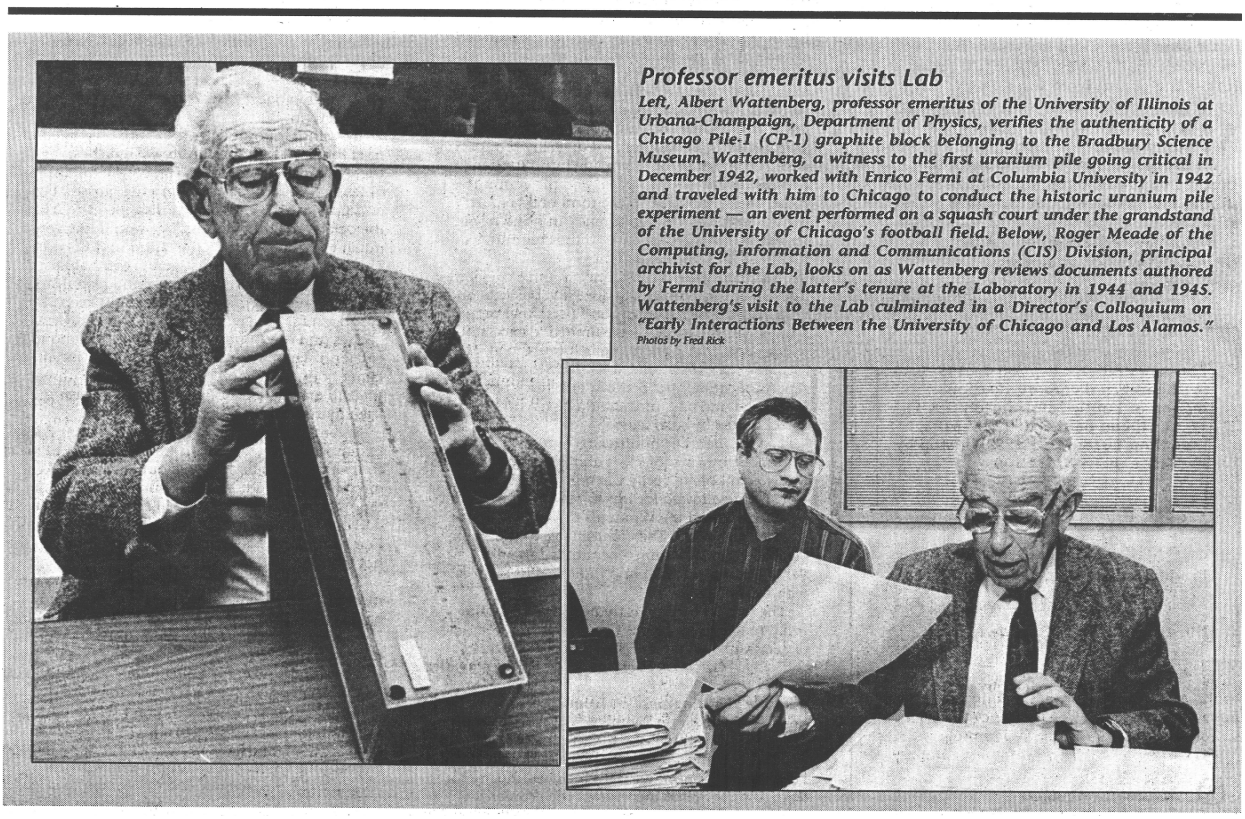
Wattenberg was present at the Chicago Pile-1 experiment. Meade, Lab historian, is pictured alongside Wattenberg in this LANL Newsbulletin account from 1993.

https://drive.google.com/file/d/1EHMpHt6ZwJ4j9aKKu6zVuvWq8xlaugSv/view?usp=sharing
caption: The Lab's Bradbury Science Museum features a bar of graphite that was stacked near the center of the core of the Chicago-Pile 1 reactor. Located in downtown Los Alamos, the museum is free and open to the public.

Looking for more?
Read, watch and listen to more fascinating stories on the Lab's illustrious history at nsrc.lanl.gov.

https://drive.google.com/file/d/1P6PHaTUtZ_ugkwG0QiFghsFlhtEx8tPm/view?usp=sharing

caption: Members of the Chicago Pile-1 team met at the University of Chicago on the experiment's fourth anniversary in 1946. Of note, future Los Alamos Lab Director Harod Agnew is on the far left of the middle row; the experiment's only female physicist Leona Marshall is to the right of center; and Nobel Laureate Enrico Fermi is on the far left of the first row.

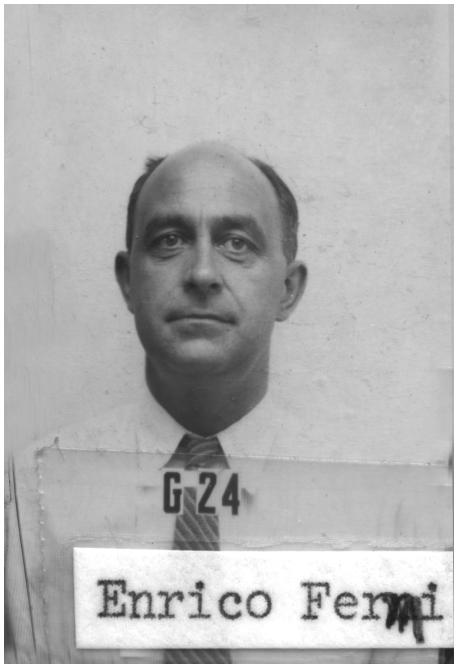


Professor emeritus visits Lab

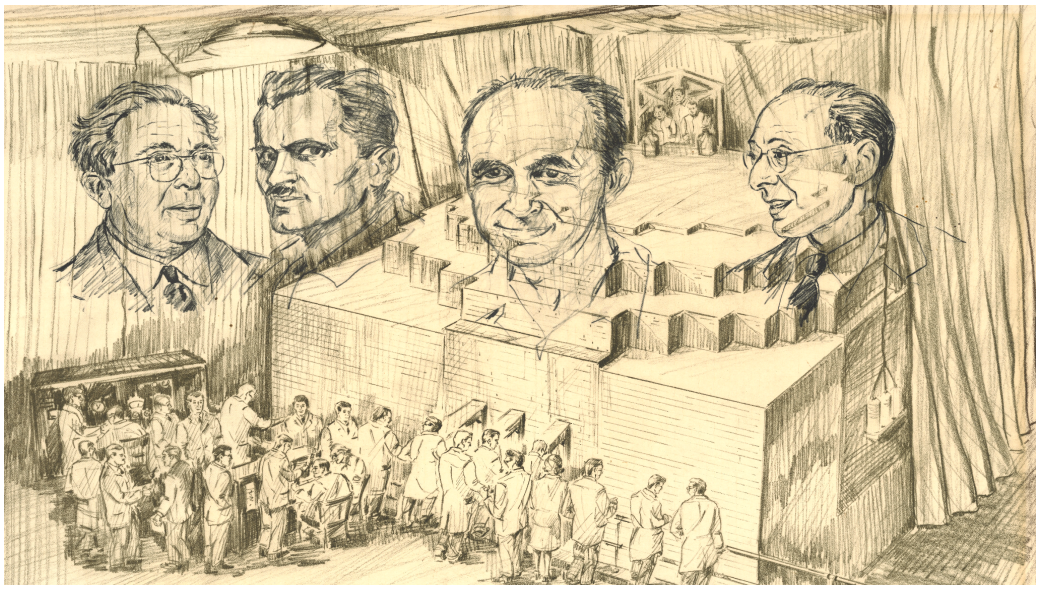
Left, Albert Wattenberg, professor emeritus of the University of Illinois at Urbana-Champaign, Department of Physics, verifies the authenticity of a Chicago Pile-1 (CP-1) graphite block belonging to the Bradbury Science Museum. Wattenberg, a witness to the first uranium pile going critical in December 1942, worked with Enrico Fermi at Columbia University in 1942 and traveled with him to Chicago to conduct the historic uranium pile experiment — an event performed on a squash court under the grandstand of the University of Chicago's football field. Below, Roger Meade of the Computing, Information and Communications (CIS) Division, principal archivist for the Lab, looks on as Wattenberg reviews documents authored by Fermi during the latter's tenure at the Laboratory in 1944 and 1945. Wattenberg's visit to the Lab culminated in a Director's Colloquium on "Early Interactions Between the University of Chicago and Los Alamos."

Photos by Fred Rick

https://drive.google.com/file/d/1CzTPoZd5VpvS5Scsz0uEHGRriQVJ6jiu/view?usp=sharing
caption: After a bar of graphite from Chicago Pile-1 was given to the Lab's Bradbury Science Museum in 1992, Albert Wattenberg verified its authenticity. Wattenberg participated in the first-ever sustained nuclear chain reaction in 1942, alongside physicist Enrico Fermi, who was instrumental in the Los Alamos lab's creation of atomic weapons during World War II. Roger Meade, Lab historian, is pictured with Wattenberg in this LANL Newsbulletin account from 1993.



https://drive.google.com/file/d/1nOe119f3GLbYbKgLdz6JQmSrBLtDz9gw/view?usp=sharing
caption: Italian physicist Enrico Fermi led the Chicago Pile-1 experiment that created the world's first self-sustaining nuclear reactor. This led to the creation of the atomic bomb at the Los Alamos lab, where Fermi continued his scientific work to help end World War II.



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This lithograph depicting Chicago Pile-1 is on display in the National Security Research Center, the Lab's classified library located in the National Security Sciences Building. The drawing was made by artist Leo Vertanian with ink made of graphite from the piles. The four prominently featured scientists are, from left, Leo Szilard, Arthur Compton, Enrico Fermi, and Eugene Wigner. It is unknown who donated the lithograph to the NSRC.